

Collaborative Research and Capacity Building for Development (a proposed new CRSP portfolio)

1. Grains, Roots and Tubers CRCBD

Rationale: Staple food crops provide the majority of starch, fat, protein, vitamins and minerals for the world's population. For poorer people staple food crops are generally a key source for these life sustaining nutrients. These crops, especially cereals, are also extremely important in animal feed systems and for industrial uses. A few of these staple crops like sorghum, millet and cassava are grown extensively in semiarid tropic and temperate regions of the world, largely due to their ability to withstand drought, high temperatures and other adverse soil conditions.

This proposed CRCBD will lead research addressing the production, marketing, processing, and utilization, of staple food crops to improve the well-being of farmers, rural communities, and developing nations in which these crops are of principal importance to the agricultural economy. The **global** research focus will be on **sorghum, millet and cassava**, but will not exclude work related to corn, wheat and rice, particularly in production systems where all crops are present. A **secondary** research focus will be on other grains, roots and tubers of **regional and local importance**. Because of its focus on food systems of importance in areas of frequent drought and other adverse conditions, there is a strong potential linkage between this CRCBD and the "Innovations in Fragile and Marginal Areas CRCBD."

Potential research topics include:

- Germplasm improvement (esp. drought tolerance, nutritional quality and composition, disease/pest resistance, value-added components)
- Marketing and trade of staple food crops
- New products and value-added opportunities of staple food crops including animal feed and industrial uses
- Biotechnology, particularly as it contributes to germplasm improvement
- Seed systems (production of seed, marketing, distribution channels for seed)
- Production systems, including water/soil conservation and management, tillage systems, environmental interactions, and multiple cropping systems (especially with legumes) in which cereal crops are important components
- Crop protection including integrated pest management strategies for: reduced pest damage; elimination of health and trade hazards (chemical residues) in both production and post-harvest stages; meeting phyto-sanitary/food safety protocols and other quality standards for trading in these commodities and their products
- Food-based nutritional attributes (energy, micro-nutrient composition and density)
- Processing, storage, and post-harvest management of staple food crops including animal feed and industrial uses
- Policy and governance issues as they relate to enhanced staple food systems

2. Legumes CRCBD

Rationale: Grain legumes or pulses occupy an important place in the world food and nutrition economy. These crops are traditional staple foods, rich in protein, complex carbohydrates, and essential mineral nutrients. Legumes are dependable cash crops for smallholders because of their adaptation to marginal soil conditions, in part due to their ability to biologically fix nitrogen.

This proposed CRCBD will lead research addressing the production, quality, processing, marketing, and utilization of staple grain legume (pulse) species to improve the well-being of farmers, rural communities, and developing nations in which these crops are of principal importance to the agricultural economy. The global research focus of the CRCBD will be on legumes of global importance including **peanuts, beans, cowpeas, chickpeas, lentils, faba beans, and dry peas**. Legumes of **local and regional importance** including **mung beans, pigeon peas, lima beans, adzuki bean, and indigenous legumes** form a **secondary** focus.

Potential research topics include:

- Germplasm improvement (esp. drought tolerance, nutritional quality and composition, disease/pest resistance, value-added components)
- Biotechnology, particularly as it contributes to germplasm improvement
- Seed systems (production of seed, marketing, distribution channels for seed)
- Production systems, including water/soil conservation and management, tillage systems, environmental interactions, nitrogen fixation as it relates to soil fertility, multiple cropping and inter-cropping systems (especially with cereals) in which grain legumes are important components
- Crop protection including integrated pest management strategies for: reduced pest damage; elimination of health and trade hazards (chemical residues) in both production and post-harvest stages; meeting phyto-sanitary/food safety protocols and other quality standards for trading in these commodities and their products Food-based nutritional attributes (energy, protein quality and composition, micro-nutrient composition and density)
- Processing, storage, and post-harvest management of grain legume crops
- Marketing and trade of grain legume crops
- New products and value-added opportunities for grain legume crops
- Policy and governance issues as they relate to enhanced grain legume-based systems

3. Aquaculture and Fisheries CRCBD

Rationale: Products from aquaculture and capture fisheries provide a vital source of food, income, employment, trade and economic well-being in developing countries. These products are the primary source of protein for some 950 million people worldwide and represent an important part of the diet of many more. Globally, people get about 20% of the animal protein they consume from fish. This is more than from any other single source and more than from beef and poultry combined. Of the 30 countries most dependent on fish as a protein source, all but four are in the developing world.

According to FAO, global fish production was about 133 million tons in 2002 of which 64% came from marine capture fisheries, 7% from inland capture fisheries, and 29% from aquaculture in marine, fresh and brackish waters. Production from capture fisheries has been relatively steady since 1980, due to over-fishing, habitat loss, environmental degradation, and poor understanding, planning and management of these “common resources”. Aquaculture production has increased since 1990 at an annual rate of 11% and is currently the fastest growing sector in the global agricultural economy. In less than 50 years, the world’s average per capita consumption of fish has almost doubled and this trend is expected to continue into the future.

To help meet this future demand, the proposed Aquaculture and Fisheries CRCBD Program will lead innovative research, training and outreach activities designed to develop and disseminate technologies, tools, practices, methodologies and policies that will help prevent further degradation of ecosystem health; sustainably increase aquaculture production; maintain and restore capture fisheries productivity; prevent and reduce poverty among subsistence and small-scale fishers and farmers; and protect valuable aquatic biodiversity.

Potential research areas include:

- **Aquaculture** activities will focus on the culture of freshwater, brackish and marine organisms including fish, shellfish and aquatic plants. This would include small-scale as well as commercial production systems. Specific topics might include: design of sustainable and economically viable aquaculture technologies and productions systems ranging from small open ponds and integrated aquaculture-agriculture systems to closed re-circulating systems; breeding and culture technologies for indigenous species; genetic improvement; fish nutrition, feeds and feeding; disease and parasite control and prevention; and mitigation of environmental interactions including biodiversity issues such as the introduction of non-native species.
- **Capture fisheries activities** will emphasize management and policy approaches that promote enhanced governance, secure livelihoods and ecosystem-based approaches to fisheries management. The primary focus will be on small-scale coastal and inland fisheries. Specific topics might include: design and management of marine protected areas and reserves as fishery management tools to maintain and enhance production; ecosystem-based approaches to fisheries management that are effective, practical and enhance and restore ecosystem productivity and function; co-management and limited access schemes to enhance production efficiency and ensure livelihoods; and development of participatory research and assessment methods.
- **Cross-cutting research areas for aquaculture and fisheries include:** economic and community-based models, methods and tools for small-scale fisheries management and sustainable aquaculture development; Value-added product development, marketing, trade, and food safety; and policy, governance and trade reform to promote sustainable aquaculture development and fisheries management that captures economic rent from public resources (fishery, water and land assets) and ensures equitable benefits.

4. Horticulture/Specialty Crops (H/SC) CRCBD

Rationale: There is strong growth potential for the production of horticultural commodities and specialty crops in emerging economies. Production of these crops promises to provide countries with the ability to meet domestic food needs, to diversify income sources, afford excellent opportunities for improvement of human health and household incomes, and can serve as an engine for agricultural and economic growth. While this sector presents many opportunities, the rapidly changing dynamics of horticulture and specialty crops markets often act as barriers to participation.

This proposed CRCBD will lead research promoting the production and marketing of vegetables, fruits, and specialty crops for increased nutrition and income potential for both small and larger producers. It will address the entire “production through marketing” system focusing on a value chain approach that emphasizes the market as the driver. The **primary research** focus will be on **vegetables, fruits, cocoa, and coffee**, for which the selected region has competitive advantage including access to a strong market. A **secondary** research focus will be on **non-timber forest products, natural products, and medicinal plants**.

Potential research topics include:

- Germplasm improvement (especially pest resistance, shelf life, and desired characteristics for value added processing)
- Biotechnology, particularly as it contributes to germplasm improvement
- Integrated pest management strategies for: reduced pest losses; elimination of health and trade hazards (chemical residues) in both production and post-harvest stages; meeting phytosanitary/food safety protocols, and other quality standards, for trading in these commodities and their products
- Soil, water, seed and other inputs’ constraints to production of these crops
- Marketing and trade of these higher valued crops and products including increased access to market information, strengthening producer and marketing organizations
- Exploration, collection, conservation and utilization of indigenous germplasm and knowledge

5. Animal-based Food Systems-CRCBD

Rationale: Animal agriculture is the largest single sector of agricultural economies in most developing countries, accounting for up to 50% of agricultural GDP. On a global basis, foods of animal and fish origin provide about 17% of the energy and more than 35% of the dietary protein for humans. Animal proteins are more digestible (96-98%) than plant proteins (65-70%) and contain higher, more bio-available, levels of essential minerals and vitamins. Developing countries are experiencing massive annual increases in the aggregate consumption of animal-source foods, an increase of five percent per year, more than three times the increase in developed countries. In per capita terms, demand for meat products is projected to increase by almost 50%. This increased demand translates into new opportunities for smallholders to link into lucrative markets for animal products.

This proposed CRCBD will lead research addressing ecosystem services related to animal production, strengthening community asset building through the animal product value chain, animal health and animal-source food safety, value added animal products, protection and enhancement of rangeland resources, and value-added animal products. The **global** research focus will be on **livestock and poultry**. A **secondary** research focus will be on **animal-source foods of regional and local importance**.

Potential research topics include:

- Zoonotic diseases (human, animal, wildlife related health issues)
- Transboundary animal health and trade
- Tsetse fly control and African regional trade
- Pastoral risk management
- Dairy development
- Fiber production, processing and marketing
- Livestock-wildlife interactions
- Food safety and human health
- Value-added livestock and poultry products
- Livestock-natural resource interfaces – rangeland GIS
- Role of animal production systems in ecosystem services
- Community asset building through livestock and poultry production value chains

6. Soil, Water & Ecosystem Services CRCBD

Rationale: Over the past 50 years, humans have changed agricultural and natural ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. The changes that have been made have contributed to substantial net gains, but these advances have been achieved with costs in the form of the degradation of many agro-ecosystems. The harmful effects of this degradation are being borne disproportionately by the poor, are contributing to growing inequities and disparities across groups of people, and are sometimes the principal factor causing poverty and social conflict.

The proposed CRCBD will lead research and development linking plot and farm level productivity with agro-ecosystem resilience. The **primary** research focus of this CRCBD will target tools, practices and methodologies that promote sound management of natural resources in agriculture. Primary topical areas include soil and water conservation and management at the ecosystem or landscape scale and valuation and payment for ecosystem services. The CRCBD will integrate activities at the smaller spatial scale (field or farm level) with interactions at the ecosystem level. The Soil, Water and Ecosystem Services CRCBD will play a key role in integrating research and consolidating knowledge regarding soil and water productivity, conservation, and management across the CRCBD Portfolio. This will include some funds for joint research with other CRCBDs. **Secondary** research will address resource access and rights as well as research on ecosystem services related to wildlife, biodiversity conservation and other areas included in the enlarged, Title XII, definition of agriculture.

Potential research areas include:

- Soil and water conservation and management – research focusing on landscape scale interactions between production and natural systems (e.g. the impact of different production and management practices such as soil and water conservation, tillage, input applications, waste management across a landscape in terms of pest/disease management, water infiltration and aquifer recharge, and other ecosystem services)
- Valuation of and compensation for ecosystem services – sustaining ecosystem services through mechanisms such as conservation easements/offsets, agricultural and non-agricultural market options, land use planning and institutional innovations,
- Sustainable intensification models – developing tools to determine where to intensify agricultural production, whether and how to integrate agricultural production and biodiversity conservation at different spatial scales to ensure multiple benefits (economic, production, conservation).
- Resource access, rights and dispute resolution,
- Institutional innovations that foster cooperation between agriculturalists and other resource users (local communities, industry, resource user groups, government).
- Development of tools and approaches for improved management of diverse landscapes for multiple purposes (agriculture, water provision, biodiversity conservation, industrial use)

7. Assets & Market Access CRCBD

Rationale: Rural households and communities can gain and sustain their assets when there is ample opportunity to participate in trade, markets and enterprises. That requires increasing the demand for rural products. In many countries, rural markets are weak and poorly linked to larger markets limiting income generating options and land and labor remain unproductive. There is little investment in value addition enterprises that could build demand for raw products and provide employment. Contract farming enterprises hold promise to provide and sustain incomes but are fraught with policy and technical constraints. Rural households can also be exposed to greater risk in the context of expanded demand and need to learn to manage these risks and opportunities. The amount of assets a household holds, the return on these assets, and the risk to losing assets all can be factors in whether a household will remain impoverished, escape poverty, or avoid poverty altogether while continuing to increase its well-being. There is a need to bolster our knowledge about asset bundles and the relationship of asset bundles to market access with evidence that reveals the factors that make certain strategies effective over the long term, what mix of interventions is best, and how different country contexts can influence the mix to allow intervention strategies to be targeted to long-term success in creating pathways to economic growth. Because this is especially true of vulnerable populations in marginal and fragile areas, research under this program will be closely linked with the Innovations for Fragile and Marginal Areas CRCBD

The **primary** research under the Assets & Market Access CRCBD will focus on how investments in enterprises are increased in local areas and how agriculture and natural resource dependent households access, protect and utilize assets. **Secondary** research will include how households and communities adapt to increased trade and market demand.

Potential research topics include:

- Institutional innovations for linking rural households and enterprises to markets
- Incentives and barriers to trade within and between regions and countries
- Incentives and barriers to investment in value addition enterprises
- Rural finance systems
- Risk mitigation including safety nets and insurance products
- Intra-community and intra-household dynamics in responding to market demand
- Accessible input, factor and product markets for enhanced equity
- Property rights, tenure security and collective action
- Relations between agricultural and non-agricultural labor
- Interactions between poverty and sustainable use

8. Innovations for Fragile and Marginal Areas CRCBD

Rationale: Fragile and marginal areas with low and variable rainfall, high temperatures, low soil organic matter, high costs of delivering services and limited investment in infrastructure, tend to have the lowest level of human well-being, including the lowest per capita GDP and the highest infant mortality rates. The combination of high variability in agro-ecological conditions and relatively high levels of poverty leads to situations where people can be highly vulnerable to changes, be they environmental or political. Many states may appear stable but their political, economic, social, and security institutions are highly vulnerable to external or internal shocks which reverberate back on fragile and marginal areas.

The proposed CRCBD will lead research addressing adaptation to, and mitigation of, agro-ecological fragility and persistent food insecurity. The **primary research** focus will be on alternative income strategies and drivers of economic growth such as policy, institutions, and trade innovations in resource poor and conflict areas. This CRCBD will play a key role in integrating research and consolidating knowledge across the research portfolio on agricultural production, income generation, market development and maintenance and regeneration of the resource base in resource poor environments. This will include some funds for joint research with other CRCBDs on fragile and marginal areas related issues and the synthesis of research undertaken across the CRCBD Portfolio.

Potential research areas include:

- Innovations that promote local and regional trade and investment to strengthen value chains for vulnerable populations
- Options for creating and sustaining employment during agricultural transformation
- Climate change adaptation and mitigation
- Impact of HIV/AIDS on agricultural production and natural resource management
- Sustainable market systems in fragile states and regions
- Livelihood risk reduction including asset preservation & generation
- Farmer-pastoralist conflict mitigation

9. **CRCBD Promotion, Integration, and Response (PIR) Program**

Rationale: Both the University and USAID communities have consistently noted the benefits that would be derived if there was greater capacity for CRCBDs to work more intensively across programs and if there was greater flexibility for taking advantage of emerging opportunities.

The CRCBD PIR Program would play a key role in integrating research and consolidating knowledge across the research portfolio and would have a dedicated yearly level of funding with the following objectives:

- Address emerging Agency issues and priorities;
- Promote Inter-CRCBD cooperation and research on issues where cooperation would be highly beneficial;
- Promote the spread amongst CRCBDs of lessons learned;
- Promote work between CRCBDs and other organizations, such as the CGIAR centers;
- Support periodic studies and assessments of the impact and direction of the CRCBD program overall.

PIR Implementation: Once an appropriate mechanism (e.g. task order, associate agreement, etc.) is established, core funds as well as funds from offices and missions can be obligated. Examples of some possible mechanisms include an associate award under the Agency's ALO agreement or an agreement with NASULGC. Most if not all funds would be obligated for Title XII University implementation. Funds would be programmed with the benefit of CRCBD Council, SPARE, BIFAD, and USAID Agriculture and natural Resources Management Sector Councils consultations.